REMARKS

This amendment is submitted in a good faith effort to advance the prosecution of the subject application and to clarify the issues for appeal. Entry thereof is respectfully requested.

Claim 1 has been amended to incorporate the requirements of claim 8, specifying that the colorant composition relative to an amount of hair to which it is applied, is in a weight ratio of about 1:10 to about 1:2 A similar amendment has been made to claim 9. Claims 8 and 14 are cancelled without prejudice.

The subject invention is directed to treatments that allow color to be added to hair gradually, employing treatments of relatively short duration (i.e. about 5 seconds to about 5 minutes), without damage to the hair. The compositions can be formulated as hair care products such as for example shampoos and conditioners. The amount of shampoo or conditioner applied to the hair is typically a relatively small amount, normally an amount such as can be held in the hand, and the subject claims have been amended to more particularly describe this amount, using a weight ratio that is consistent with these types of applications. Thus, in the claims as hereby amended, by weight, the amount of conditioner is significantly less than that of the hair to which it is applied.

In contrast, conventional colorant compositions, for example box colorants, typically employ larger amounts of colorant composition for the amount of hair treated. Applicants note that the colorant compositions exemplified by Examples O and Q of Nomura et al. are applied following treatment procedures wherein twenty grams of hair were bundled and spread with the same volume mixture of a hair coloring composition prepared from a 1:1 mixture of color lotion and oxidizer. See the treatment procedure at page 10 of the citation. The density of chemically unaltered hair is reported as being from 1.320 to 1.327g/ml at pp 822-823 of Clarence R. Robbins, "Chemical and Physical Behaviour of Human Hair, 3rd Edition, 1994 (copy attached). Applying this ratio, and estimating the hair coloring composition of Nomura et al. as having a density comparable to that of water (about 1 g/ml), the calculated product to hair ratio (by weight) of the Nomura et al examples would be expected range from about 20g hair coloring composition to 26.4g of hair

(1:1.32) to about 20g hair coloring composition to 26.5g of hair (1: 1.33). Thus, the amount of hair coloring composition applied by Nomura et al. is significantly greater than the maximum amount (1:2) set forth in the subject claims as hereby amended.

To summarize, pursuant to the subject invention it was found that in hair colorant compositions formed by the mixture of alkaline dye and oxidizing components, the incorporation of a relatively high level of chelant in combination with a water soluble ammonium carbonate or carbamate salt, provides compositions that provide a means of substantially avoiding hair damage, such that the compositions can be used on a regular basis, in relatively small amounts, in forms such as, for example, daily shampoos or conditioners, to attain and maintain a desired degree of permanent hair coloration.

There is nothing in Nomura et al. that discloses or suggests the treatment times or hair coloring composition to hair ratios required by the subject claims. Nor is there anything in the citation that discloses or suggests that the combination of relatively high levels of an ammonium carbonate (or carbamate) salt and chelant can provide colorant compositions that provide a means of substantially avoiding hair damage and that enable users to achieve gradual hair coloration over time using the relatively short duration treatments described by the subject claims. The arguments previously made with respect to Schwartzkopf (FR1070766) and Lapidus et al US 4,104,021) are incorporated by reference and repeated herein.

In view of the foregoing, reconsideration and allowance of the subject claims. as hereby amended, is respectfully requested.

If a telephone conversation would be of assistance in advancing the prosecution of the present application, applicants' undersigned attorney invites the Examiner to telephone at the number provided.

Respectfully submitted,

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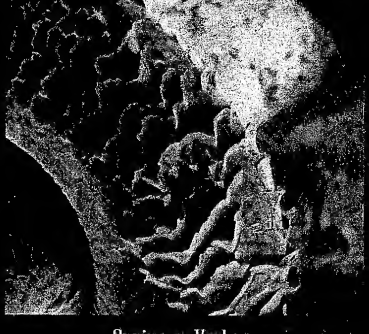
Chemical and Physical Behavior of Human Hair

Third Edition



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To my wife Gene, fo
every day a good one
an inspiration to m
Mark and his wife,
and his family, my
Gordon, and my ma
to make life meanin

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TABLE 8–7. Torsional moduli of waved and unwaved hair.[a]

%R.H	Unwaved hair ($E_T \times 10^{-10}$ dynes/cm^2)	Waved hair ($E_T \times 10^{-10}$ dynes/cm^2)
41	1.19	1.25
58	1.06	1.13
65	0.89	0.99
81	0.78	0.76
93	0.42	0.40
100	0.22	0.14

[a] From data of Bogaty [77].

implicate the cuticle as primarily responsible for this increase in torsional plastic behavior for human hair in water.

Torsional Behavior of Damaged Hair

Bogaty [77] has examined the torsional properties of permanent-waved and unwaved hair. His results (Table 8–7) suggest that waved hair is more rigid at low RH and less rigid above 90% RH than unwaved hair. Wolfram and Albrecht [78] examined the torsional behavior of permanent-waved, bleached, and dyed hair. These scientists confirmed the finding of Bogaty that permanent waved hair (reduced hair) is less rigid than chemically unaltered hair in the dry state. These same scientists also found that the rigidity ratio ($R_{water}/R_{65\%\,RH}$) is lower for bleached hair than for dyed hair, consistent with the greater amount of disulfide bond cleavage in bleaching as compared to permanent dyeing. If one takes ratios of dry to wet torsional moduli in Table 8–7, it is apparent that there is a greater effect of moisture on the torsional properties of waved hair than on those of unaltered hair.

The torsional behavior of hair is more dependent than is the tensile behavior on the cuticle or the external layers of the fiber. Torsional behavior is also more sensitive to water than tensile properties, and waving and bleaching do change the torsional properties of hair, as demonstrated by Wolfram and Albrecht. Therefore, it is conceivable that torsional methods may in time prove to be more sensitive to whole-fiber hair damage than the currently used tensile methods.

Density of Hair

We have determined the density of human hair in solutions of benzene-carbon tetrachloride by the method of Abbott and Goodings [81]. The density of chemically unaltered hair at 60% RH varied from 1.320 to

TABLE 8–8. Variation in the density of wool fiber with RH.[a]

%RH	Density
0	1.304
15	1.3135
25	1.3150
68	1.3125
85	1.304
94	1.2915
100	1.268

[a] Data from King [82].

1.327, depending on lot (dark-brown European hair from DeMeo Bros., New York, and three samples taken from heads of volunteers). The density of our wool control was 1.320, identical with one lot of hair. Permanent waving did not change the density of hair. Bleaching (approximately 25% disulfide rupture) increased it, but only by 0.45%.

King [82] determined the density of wool fiber as a function of RH, and some of his results are summarized in Table 8–8. The data show that the density changes for wool fiber from 15% to 85% RH are negligible (normal room humidities), and one would expect the density versus RH relationship for wool and human hair to be similar, because their densities at 60% RH and their moisture binding–RH relationships are virtually identical (see Table 8–16, later in chapter). The increase in fiber density with moisture regain from 0% to 15% RH is contrary to expectations and is not fully understood [83].

The objective of these density experiments was not to determine the absolute density of human hair, which is elusive [83], but to determine the relative density of human hair and wool fiber and the influence of damaging cosmetic treatments on this important property. The results of these experiments confirm the conclusions of several others [70,84]: the densities of human hair and wool fiber are similar, and there is no appreciable change in the density of human hair from permanent-waving or bleaching treatments.

Dimensions and Swelling Behavior

Two of the most commonly measured hair fiber dimensions are its length and its diameter. Assuming that a hair fiber approximates a cylinder, its volume, cross-sectional area, radius, and surface area may be obtained from formulae that describe the volume of a cylinder (V), the area of a